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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/605,442	06/28/2000	Leon R. Barstad	50439-2	5430

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EXAMINER

NICOLAS, WESLEY A

ART UNIT

PAPER NUMBER

1741

DATE MAILED: 01/24/2003

16

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)	
09/605,442	ARSTAD ET AL.	
Examiner	Art Unit	
Wesley A. Nicolas	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 124-153 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 124-153 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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DETAILED ACTION

This is in response to the Amendment dated November 19, 2002. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 124-153 are currently pending in this application.

Election/Restriction

1. Cancellation of non-elected claims 28-123 has been noted.

Terminal Disclaimer

2. The terminal disclaimer filed on July 29, 2002 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of Application No. 09/313,045, has been reviewed and is accepted. The terminal disclaimer has been recorded. As such, there are no double-patenting rejections pertaining to Application No. 09/313,045.

Claim Objections

3. The claim objections of claims 138 and 139 have been **withdrawn** in view of the amendment submitted by Applicant on November 19, 2002.

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Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 124-136 are rejected under 35 U.S.C. 102(e) as being anticipated by Landau et al. (6,379,522).

Claim 124 is rejected because Landau et al. teach a method for plating a semiconductor microchip wafer substrate, comprising:

- electrolytically depositing copper onto a semiconductor microchip wafer substrate (col. 1, lines 45-46: "semiconductor substrates... metal seeded wafers"),
- having microvias or trenches (col. 1, lines 6-11: "micron scale features and smaller"), from an electroplating composition that comprises at least one soluble copper salt (col. 3, lines 51-55: "aqueous copper plating... copper sulfate"), an electrolyte (col. 3, lines 60-64: "copper chloride... or with little supporting electrolyte"), and
- one or more brightener compounds having a molecular weight of about 1000 or less (col. 3, lines 40-41: "2-amino-5-methyl-1,3,4-thiadiazole" which has a molecular weight of ~115) and that are present in a concentration of at least about 1.5 mg per liter (col. 3, line 42: "0 ppm to about 20 ppm" is the same as 0-20 mg per liter) of the electroplating composition.

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Claim 125-132 are rejected because Landau et al. teach that the brightener concentration is at least about 20 mg per liter of the electroplating composition (col. 3, line 42: "0 ppm to about 20 ppm" is the same as 0-20 mg per liter).

Claim 133 is rejected because Landau et al. teach that the electroplating composition further comprises a suppressor agent (col. 5, lines 37-44: "...suppressed by polyalkylene glycol carriers...").

Claim 134 is rejected because Landau et al. teach that the suppressor agent is a polyether (col. 5, lines 37-44: " $\text{H}(\text{OCH}_2\text{CH}_2)_x(\text{OCH}_2\text{CH}(\text{CH}_3))_y\text{OH}$ ").

Claim 135 is rejected because Landau et al. teach that the electroplating composition further comprises a halide ion source (col. 3, line 61: "...copper chloride...").

Claim 136 is rejected because Landau et al. teach that the microchip wafer substrate is electrically attached to a cathode of the system (claim 1: "...disposing an electrically resistive substrate and an anode in a plating solution..." wherein the substrate defined in col. 1, lines 45-46 as "semiconductor substrates...metal seeded wafers").

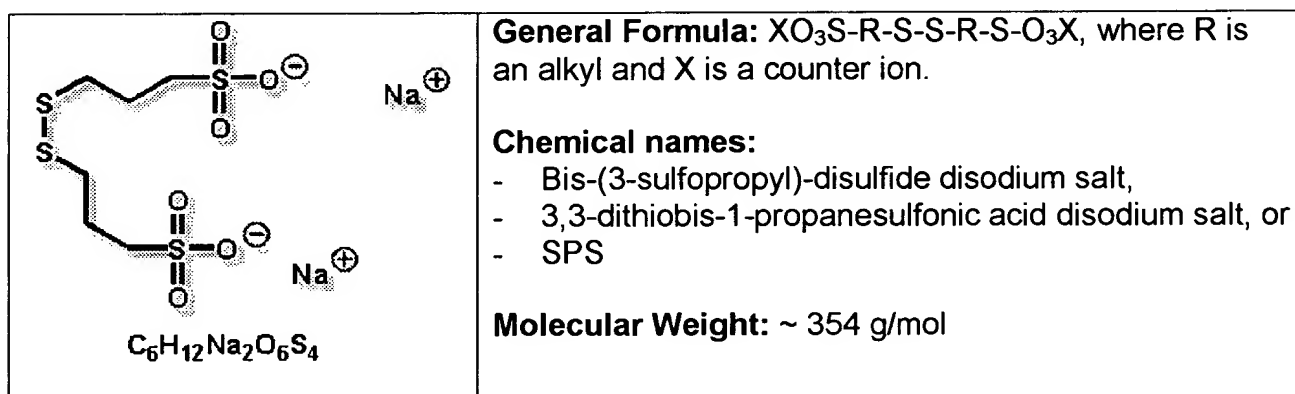
Claim Rejections - 35 USC § 103

6. The 35 USC § 103 rejections as set forth in the previous Office action have been **withdrawn** in view of the argument submitted by Applicant on November 19, 2002.

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7. Claims 137-153 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Landau et al. (6,379,522), and further in view of Dahms et al. (5,433,840).

Landau et al. are as applied, argued, and disclosed above and incorporated herein and further teach an additive (as an accelerator) of the following compound (col. 5, lines 48-59: "3,3-dithiobis-1-propanesulfonic acid"):



Landau et al. fail to specifically teach that the sulfide compound is used as a brightener, or of the specific additive of 3-mercaptopropane-1-sulfonate.

Dahms et al. teach the use of a sulfide brightener such as 3-mercaptopropane-1-sulfonate (Table 2).

Claims 137-138 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have used the SPS additive (i.e. "3,3-dithiobis-1-propanesulfonic acid disodium salt" or "Bis-(3-sulfopropyl)-disulfide disodium salt") of Landau et al. as a brightener as taught by Dahms et al. because Dahms et al. teach that the SPS is used as a brightener (Table 2: Bis-(w-sulfopropyl)-disulfide disodium salt) and it is expected that SPS would have the same effect in Landau et al. which would provide a bright deposit.

It should be noted that electroplating is somewhat of a "black art" in that the specific function of additives (whether it be levelers, brighteners, grain refiners, stress reducers, wetting agents, etc.) is not always clear and many additives have multiple functions and the specific effect can change depending on the additives interaction with other additives. As such, although Dahms et al. does not specifically teach the electroplating of "semiconductor microchip wafer substrates", a person skilled in the art is deemed to have been aware of well-known materials and their uses, enough to have been able to use the electroplating bath to plate other substrates. Therefore, a combination of features shown by references is legally obvious if it would have been obvious to "the inventor working in his shop with the prior art references--which he is presumed to know--hanging on the walls around him." In re Winslow, 365 F.2d 1017, 1020, 151 USPQ 48, 50, 51 (CCPA 1966).

Claim 139 is rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Landau et al. to use the additive of Dahms et al. because Dahms et al. teach the use of a brightener additive such as 3-mercaptopropane-1-sulfonate (Table 2) would also strengthen the conductors on the substrate (col. 1, lines 7-12) thereby providing a more durable interconnect and plated layer.

Claim 140 is rejected because Landau et al. teach that the additive is a bissulfopropyl disulfide compound (col. 5, lines 52-53: "3,3-dithiobis-1-propanesulfonic acid" is a bissulfopropyl disulfide compound).

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Claim 141 is rejected because Landau et al. teach that the additive compound has a molecular weight of 1000 or less (col. 5, lines 52-53: "3,3-dithiobis-1-propanesulfonic acid" has a molecular weight of 354 as set forth above).

Claim 142-145 are rejected because Landau et al. teach that the additive concentration is at least about 5 mg per liter of the electroplating composition (Example 1, SPS concentration is 5 ppm = 5 mg per liter).

Claims 146-149 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Landau et al. to increase the additive concentration to at least 15 mg per liter as taught by Dahms et al. because Dahms et al. teach of an SPS (i.e. "3,3-dithiobis-1-propanesulfonic acid disodium salt" or "Bis-(3-sulfopropyl)-disulfide disodium salt") concentration of between 1 and 50 mg per liter (Table 2: same as 0.001 to 0.05 grams per liter) which would have aided in increasing the brightness of the deposit.

Claim 150 is rejected because Landau et al. teach that the electroplating composition further comprises a suppressor agent (col. 5, lines 37-44: "...suppressed by polyalkylene glycol carriers...").

Claim 151 is rejected because Landau et al. teach that the suppressor agent is a polyether (col. 5, lines 37-44: " $\text{H}(\text{OCH}_2\text{CH}_2)_x(\text{OCH}_2\text{CH}(\text{CH}_3))_y\text{OH}$ ").

Claim 152 is rejected because Landau et al. teach that the electroplating composition further comprises a halide ion source (col. 3, line 61: "...copper chloride...").

Claim 153 is rejected because Landau et al. teach that the microchip wafer substrate is electrically attached to a cathode of the system (claim 1: "...disposing an

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electrically resistive substrate and an anode in a plating solution..." wherein the substrate defined in col. 1, lines 45-46 as "semiconductor substrates...metal seeded wafers").

REMARKS - Response to Arguments

The prior art rejections as set forth in the previous Office action have been **withdrawn**. As such, new art rejections are set forth above because Examiner found better prior art in an updated search. Therefore, this Office action is a **Non-Final** Office action given the new grounds of rejection.

Applicant maintains that there is no motivation or suggestion to use the same electroplating bath which is used for "circuit boards" in the context of plating "semiconductor microchip wafer substrates." Examiner must respectfully disagree. The prior art rejection using Landau et al. above shows that similar electroplating baths with similar or identical additives can be used in both "circuit board" plating and "semiconductor microchip wafer" plating. Furthermore, a person skilled in the art is deemed to have been aware of well-known materials and their uses, enough to have been able to put these sources together to make an invention.

A combination of features shown by references is legally obvious if it would have been obvious to "*the inventor working in his shop with the prior art references--which he is presumed to know--hanging on the walls around him.*" In re Winslow, 365 F.2d 1017, 1020, 151 USPQ 48, 50, 51 (CCPA 1966).

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As Applicant is well aware, the progression of the electroplating art in the context of plating circuit features, has moved in the direction of smaller and smaller substrates. First starting out with "circuit boards" and eventually moving to "semiconductor microchip wafers" with feature (or pattern) sizes getting smaller and smaller. One who is skilled in the art of electroplating would ordinarily use what he currently knows about the art (i.e. electroplating bath compositions) to experiment with different substrates.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley Nicolas whose telephone number is (703)305-0082. The examiner can normally be reached on Mon.-Thurs. from 7am to 5pm.

The Supervisory Primary Examiner for this Art Unit is Roy King whose telephone number is (703) 308-1146.

The fax number for this Group is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.



Wesley Nicolas

January 16, 2003